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ABSTRACT

The equivalency of the students of three kindergarten through grade 12 (K-12) exit programs in Saskatchewan (Canada) was investigated. The programs were: (1) the Adult Basic Education Program (ABE); (2) the Division IV program; and (3) the General Educational Development (GED) tests. Participants were 134 Division IV students, 67 ABE students, and 69 GED students. The programs were compared on the basis of: their student profiles; their performance on the General Ability Battery (GAB); student performance on the Arlin Test of Formal Reasoning (ATFR); and predictions of eligibility for college. Regression analysis indicated that a larger number of Division IV and GED students (83.6% and 84.1%, respectively) fell within the scores of university eligibility, using the GAB and ATFR tests as criteria, than did ABE students (47.8%). A larger percentage of GED students than ABE students had received formal schooling beyond grade 10. ABE students appeared less able in general to deal with the quantitative and verbal skills demanded by the GAB and the formal reasoning tasks of the ATFR. Twenty-four tables provide test scores. The student personal survey forms and samples of forms used in the study are appended. (SLD)

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A COMPARISON OF THE STUDENTS COMPLETING THREE K-12 EXITING PROGRAMS: ABE, DIVISION IV, AND GED

Researcher/Writer:
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SIDRU Research Report No. 14
October 1989

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Faculty of Education, University of Regina, Regina Sask. S4S 0A2

A COMPARISON OF THE STUDENTS COMPLETING THREE K-12 EXITING PROGRAMS: ABE, DIVISION IV, AND GED

Prepared for the
Saskatchewan Instructional Development and Research Unit

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by
William Toews, Ph.D.
October 1989

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EXECUTIVE SUMMARY

This study compares the level of equivalency of the students of three K-12 exit programs: the Adult Basic Education program, the Division IV program and the General Educational Development tests. The students were compared on the basis of their profiles, their performance on the General Ability Battery and the Arlin Test of Formal Reasoning and on their predicted success at the university.

1. A greater percentage of GED students than of the ABE students had enrolled in school beyond the Grade 10 level.

2. The average age of the GED students was about two years greater than that of the ABE students, and they indicated that they had been employed about five years longer than had the ABE students.

3. A much higher percentage of the Division IV students than of the ABE students had plans of going on to university, and a higher percentage of the ABE students than of the GED students had plans of going on to university.

4. Enrollment in multiple Mathematics and Science classes was much greater for the Division IV students than it was for the ABE students.

5. The minimum GAB and ATFR scores of both the Division IV and GED students were equivalent. These were higher than those of the ABE students. When considering the GAB and ATFR scores as criteria of acceptable performance for Grade 12 standing, at least 80.6% of the ABE students performed at the Grade 12 (Division IV) level.

6. The GED students scored significantly higher than did the Division IV students in Word Meaning. The Word Meaning scores of the ABE students did not differ significantly from those of both the Division IV and GED students.

7. For all GAB subtest score comparisons (except for Word Meaning) the Division IV and GED students' scores were statistically equivalent.

8. The ABE students scored significantly lower than did the Division IV students on Verbal Analogies and significantly lower than both the Division IV and GED students on both Arithmetic Problems and Logical Answers.

9. The Verbal Analogies test scores of both the ABE and GED students were statistically equivalent.

10. The relatively high performance of the GED students on the GAB test may reflect the skill emphasis and higher skill emphasis observed in the GED test items.

11. The GED students scored significantly higher than did the ABE students on the GAB (total) test. The Division IV students (the middle scoring group) scored statistically equivalent to both the GED and ABE student groups.

12. The mean scores of the Division IV and GED student groups on the ATFR were statistically equivalent. The ABE students scored significantly lower than did both the Division IV and GED student groups.

13. The Average high school score, frequency of enrollment in Geometry, and Gender were significant predictors of the Division IV (total sample) GAB scores. Gender favored the males. The variance of the GAB scores explained by these predictors was 38.4%.

14. The Average high school score, Gender, and frequency of enrollment in Geometry, Calculus, and Physics were significant predictors of the Division IV (total sample) ATFR total scores. Gender favored the males and enrollment in Calculus was a negative predictor when taken together with the other variables. The variance of the ATFR scores explained by these predictors was 42.1%.

15. The Average ABE program scores and frequency of enrollment in Geo-Trigonometry, Computer Science, Chemistry, and Biology were significant predictors of the ABE GAB scores. Enrollment in Computer Science, Chemistry, and Biology were negative predictors. The variance of the GAB scores explained by the total predictor set was 40.5%.

16. Frequency of enrollment in Physics and the Average ABE program scores were significant predictors of the ABE ATFR scores. The variance of the ATFR scores explained by these predictors was 39.4%.

17. The Average GED test scores and Gender were significant predictors of both the GED GAB and ATFR scores. For the GAB, Gender favored the female students, for the ATFR, Gender favored the male students. The variance of the GAB scores explained by these variables was 61.5%, and for the ATFR, 51.7%.

18. Given the university entrance criteria (for the Faculty of Arts, University of Regina) of the Division IV students, and the multiple linear regression predictive models for the respective groups, the percentages of university-eligible students was 83.6% for the Division IV students, 47.8% for the ABE students, and 84.1% for the GED students.

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INTRODUCTION

A previous study — *A Comparison of Three K-12 Exiting Programs: ABE, Division IV and GED* — investigated the equivalency of the ABE and Division IV programs in terms of hours spent in the courses, their objectives, the content/skill emphases, and the evaluation criteria (Toews, 1988). The study further explored the similarity between the GED and the other two programs in their evaluation requirements concerning the content, skill, and the evaluation criteria levels.

It was found that the Division IV curricula present a broader scope than do the ABE curricula in Communications, Mathematics, and Science; the Social Studies curricula have a strong common core. The Division IV curricula emphasize skill more strongly than do ABE curricula in Communications, Mathematics, and Science; the Division IV Social Studies curriculum emphasizes content more strongly than does the ABE curriculum. Furthermore, it was found that the Division IV curricula emphasize the higher cognitive skills more than do the ABE curricula in Communications, Science, and Social Studies; the Mathematics curricula are quite similar in higher cognitive skill emphasis.

Although the GED is very comprehensive in Social Studies content, it is very lacking in the subjects of Communications, Mathematics, and Science. The GED test items were found to be higher in skill emphasis than are the evaluation criteria of both the Division IV and ABE curricula in Communications (Writing Skills), Mathematics, Science, and Social Studies; however, Division IV ranks higher in skill emphasis than does the GED in the Literature section. GED test items were found to contain a higher proportion of test items having a higher cognitive level emphasis than was found in the evaluation criteria in both the Division IV and ABE programs, in Communications (Writing Skills), Mathematics, and Science. The Division IV and ABE Social Studies programs, however, emphasize higher cognitive levels, apart from knowledge and comprehension, than does the GED. Division IV Literature emphasizes higher cognitive skills than does the GED.

Because the interpreted curricula (Division IV and ABE) may not necessarily agree with the initial curricula goals to be achieved, it was decided to test selected student samples enrolled in each of the three programs. The purpose of this study is to compare students enrolled in each of the three programs on their performance in formal logical reasoning (using the Arlin Test of Formal Reasoning), and their performance in verbal and quantitative tasks (using the Schubert General Ability Battery). Performance on these tests is furthermore compared with other demographic variables and the students' success in their previous programs. Specifically, the questions addressed in this study are:

1. What is the profile of the Division IV students concerning gender, average graduating grade in previous program, courses taken in Mathematics and the Sciences, and career plans?

2. What is the profile of the ABE students concerning gender, age, last grade enrolled, years since last grade at school, years of employment, courses taken in Mathematics and the Sciences, and career plans?

3. What is the profile of the GED students concerning gender, age, last grade enrolled, years since last grade at school, years of employment, and career plans?

4. How do the students completing Grade 12 standing in each of the Division IV, ABE, and GED programs compare in their performance on:

   a. The General Ability Battery (GAB)?

   b. The Arlin Test of Formal Reasoning (ATFR)?

5. How does performance of the Division IV students on the GAB and ATFR relate to gender, the high school average, and enrollment in Mathematics and Science subjects?

6. How does performance of the ABE students on the GAB and the ATFR relate to gender, age, grades completed, years since last in school, years employed, performance in the Adult Basic Education program, and enrollment in Mathematics and Science subjects?

7. How does performance of the GED students on the GAB and ATFR relate to gender, age, grades completed, years since last in school, years employed, and performance in the GED tests?

METHODOLOGY

Instruments

While mastery of content, particularly for the Division IV and ABE students, is largely measured by the tests in their respective programs, it was the concern of this study to focus primarily on the intellectual skills of the subjects. Two tests

chosen were — the General Ability Battery (GAB) and the Arlin Test of Formal Reasoning (ATFR).

The GAB developed by Herman J.P. Schubert is comprised of four subtests — Word Meaning, Verbal Analogies, Arithmetic Problems, and Logical Answers. The choices for the responses are presented in multiple-choice format. The subtests each require eight minutes to complete. Provision is made for the student to identify the number of questions completed at the 4-minute mark. Directions for administration and scoring are clearly presented (Schubert, 1986).

The GAB was designed to indicate levels of "success in school, college, and professional curricula" (Schubert, 1986, p. 1). Reliability correlations between the even-numbered and odd-numbered questions for high school seniors yielded coefficients from 0.86 to 0.93 (corrected for length). Test-retest reliability coefficients carried out on a group of 65 junior executives yielded a coefficient of 0.70. Using a sample of 183 entering-college freshmen, correlation coefficients of the 4-minute scores of the four subtests with the 8-minute scores ranged from 0.66 to 0.88 (Schubert, 1986).

Several validity measurements of the GAB have been undertaken. In several test administrations, the correlations of subtest scores with high school achievement varied from 0.14 to 0.54, for college freshmen from 0.20 to 0.54. (Significant correlations were calculated for most subtests.) Correlations of the GAB subtest scores with college marks in various subjects yielded significant correlation coefficients for all subject areas presented. The Word Meaning subtest predicts college grades in Language, Economics, Psychology, and Mathematics. The Verbal Analogies subtest predicts college grades in Biology, Economics, English, Foreign Languages, Mathematics, and Psychology. The Arithmetic Problem subtest scores correlate significantly with grades in Economics and Physics. The Logical Answers subtest reflects both cognitive and emotional factors and correlates positively with Accounting.

The Arlin Test of Formal Reasoning (ATFR) is a 32-item test to which students respond in a multiple choice format. It is comprised of eight subtests, each comprised of four test items. The subtests are — Volume, Probability, Correlations, Combinations, Proportions, Momentum, Mechanical Equilibrium, and Frames of Reference (Arlin, 1984).

A multi-trait, multi-method validity study of an earlier version of the ATFR indicated that cross-validation of the paper and pencil ATFR with individual clinical interviews yielded valid results. Shayer (personal communication to Arlin, 1983) found that the correlations between his lab-oriented, assessment device correlated as high as 0.8 and 0.9 with the ATFR.

Test-retest reliabilities (time spans between test administrations varied from eight weeks to six months) were of the order of 0.76 to 0.89. Hoyt estimates of reliabilities for the total test ranged from 0.71 to 0.89, depending on the age of the subjects and the particular revision of the test. The Cronbach Alphas for the total test ranged from 0.60 to 0.73 (Arlin, 1984). In a critique of the ATFR, Santmire (1985) indicates that the major strength of the ATFR is in its ability to measure the degree of formal operational reasoning. In this study only the total ATFR test score is used to provide a measure of the students' performance in formal reasoning tasks.

In addition to the Commitment Form, the students were asked to complete two other forms — the Release Forms and the Personal Data Forms. The GED students were informed that signing the Release Form also implied permission to release the GED test results for this study. The Personal Data forms requested information concerning location, gender, age, previous schooling, employment, and plans for the future. (See copies of these forms in Appendix 1.)

TESTING PROCEDURE

An initial attempt to carry out the testing was made in the spring of 1988. However, because schools were unable to release school time for this research project during preparations for final exams, a plan was made to carry out the study in the fall of 1988. Since the study concerned, in part, the eligibility of the ABE students to gain access to higher centers of learning, the plan was to intercept students who had completed their program and had now enrolled at the higher centers of learning. The findings indicated, however, that the number of ABE graduates enrolling at either university or at the SIAST campuses was insufficient to carry out a meaningful study. Therefore, the decision was made to carry out the study early in 1989, ensuring that all testing with the Division IV students be completed by the end of April so as not to interfere with year-end evaluations in the schools.

Contacts were made with the ABE students, through the four Saskatchewan Institute of Applied Science and Technology campuses — Kelsey, Palliser, Woodland, and the Cowan Centre — and with the Southeastern Regional College in Weyburn and the Parkland Regional College in Melville. Arrangements were made to carry out the testing toward the end of the school year with those students who had completed their Grade 12 during the time period from January to the end of June of the current year, 1989.

Division IV students were chosen from four schools in the regions close to the four SIAST campuses and from one school located in the area of one regional college. One school declined involvement in the study. Random procedures were used to select appropriate schools in the larger centers that had more than one school. An attempt was made to provide some match between the ABE course requirements and the courses taken by the Division IV students. The sample was restricted to those students who had taken at least one Mathematics and one Science class in Grade 11 and at least one Mathematics or one Science class in Grade 12. A random sample, with the given parameters, was obtained from only one school. Other schools provided classes in Algebra 30 (average to above average), Geo-Trigonometry 30 (above average), Economics 30 (average), and Calculus (average).

Contacts were made with personnel administering the GED exams at the six centers and arrangements were made to meet with students writing the GED exams. Permission was granted to briefly present the research project to the students and to obtain signatures and addresses on Commitment Forms. Details concerning testing dates were then mailed to the students individually. Administration dates usually coincided with the dates of subsequent writings of the GED in that area. However, since the response rate of the GED students was initially very low, it was decided to grant a $10.00 stipend to all participating GED students and to supply payment for out-of-town travel.

RESULTS

Sample

A total of 147 Division IV students participated in some aspects of the study. Thirteen of these were, however, discarded because of incomplete data, lack of signed Release Forms, or because the students had not completed Grade 12. This left a total of 134, 74 of which were males, 60 were females. Forty-six students comprised the randomly selected sample — 22 were males, 24 were females.

One hundred nine ABE students participated in the study. However, only 67 of these had completed Grade 12 in the time designated. Sixteen were male and 51 were female. These 67 students comprised the total ABE student population for the centers chosen.

Ninety-five GED students participated in the study. However, only 69 of these performed at the Grade 12 level on the GED. Thirty-six were male and 33 were

female. Under the voluntary participatory conditions indicated above, these 69 students comprised the total GED student population for the centers chosen.

Profile

Division IV Students (Total Sample)

The average age of the Division IV students (total sample) was 17.6 years, with a standard deviation of 1.18; one person was 28 years old. The high school average mark was 79.1 with a standard deviation of 9.07 and a range of 56 to 97. (Averages were calculated according to the University of Regina entrance guidelines for the Faculty of Arts. See University of Regina General Calendar, 1989-1990, pages 19 to 20.)

The majority of the students (85.8%) took two Algebra classes (Table 1). Most high schools offered Geo-Trigonometry classes rather than Geometry, thus the relatively high enrollment in Geo-Trigonometry. Only three of the five schools offered Calculus. Surprisingly, 61.2% of the students did not take a Computer Science course beyond the Grade 10 level.

Table 1
Number of Division IV Students and the Number of Math Classes Completed

No. of classes	Algebra		Geo-Trig		Geom		Calc		Compsc	
	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
0	2	1.5	22	16.4	121	90.3	93	69.4	82	61.2
1	17	12.7	46	34.3	13	9.7	40	29.9	31	23.1
2	115	85.8	66	49.3	0	0.0	0	00.0	21	15.7

It is interesting that a higher number of students took no Biology than those not taking either Chemistry or Physics (Table 2). Over half of the Division IV students completed two classes in at least one of the Sciences. The order of popularity of the Sciences was Chemistry, Physics, and then Biology.

Table 2
Number of Division IV Students and the Number of Science Classes Completed

No. of classes	Biology		Chemistry		Physics	
	Freq	Perc	Freq	Perc	Freq	Perc
0	27	20.1	13	9.7	21	15.7
1	18	13.4	24	17.9	22	16.4
2	89	66.4	97	72.4	91	67.9

Of the 134 Division IV students, 100 (74.9%) indicated plans of continuing on to university either immediately or in the near future, 19 (14.7%) students were planning to receive training in some college or technical school, 7 (5.2%) indicated interest in further education, 4 (2.9%) were considering either permanent or better employment, the remaining 4 did not respond.

Division IV Students (Random Sample)

The high school average mark of the Division IV students (random sample) was 77.8% with a standard deviation of 10.39 and a range of 56 to 94. (Averages were calculated similar to those in the total Division IV group.) Again, the majority of the students (82.6%) took two Algebra classes (Table 3); all took at least one. Geo-Trigonometry was a much more popular class than was Geometry. Just under one third of the students took Calculus and just under one third of the students took a Computer Science course beyond the Grade 10 level. Percentages were generally quite similar to those of the total Division IV group.

Table 3
Number of Division IV Students (Random Sample) and the Number of Math Classes Completed

No. of classes	Algebra		Geo-Trig		Geom		Calc		Compsc	
	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
0	0	00.0	12	26.1	45	97.8	32	69.6	32	69.6
1	8	17.4	14	30.4	1	2.2	14	30.4	14	30.4
2	38	82.6	20	43.5	0	00.0	0	00.0	0	00.0

The three Science classes were almost equally popular (Table 4) with just over three quarters of the students enrolling in two classes in each of the Sciences. All students took at least one Chemistry class. The percentage of students not enrolling in one or other of the three Sciences was greater for the total group than it was for the random group. Furthermore, a larger percentage of the random group took two classes in each of the three Sciences than did those in the total group.

Table 4
Number of Division IV Students (Random Sample) and the Number of Science Classes Completed

No. of classes	Biology		Chemistry		Physics	
	Freq	Perc	Freq	Perc	Freq	Perc
0	5	10.9	0	00.0	5	10.9
1	5	10.9	11	23.9	6	13.0
2	36	78.3	35	76.1	35	76.1

Of the 46 Division IV students, 35 (76.1%) indicated plans of continuing on to university either immediately or in the near future, 4 (8.7%) were planning to receive training in some college or technical school, 1 (2.2%) indicated interest in further education, 3 (6.5%) were considering either permanent or better employment, the remaining 3 did not respond. The proportion of students interested in university was very similar to that of the total Division IV group.

ABE Students

The average age of the ABE students was 30.3 years with a standard deviation of 7.32. The scores ranged from 19 to 50. More students were last enrolled in Grade 10 than in any other grade (Table 5). Just over 30% of the students never got beyond Grade 9. The ABE students' average score as obtained in the ABE program was 74.6% with a standard deviation of 9.86. The scores ranged from 56 to 94. (Averages were calculated by applying, as well as possible, the University of Regina entrance standards to the Faculty of Arts. Only those courses closest to the accepted subject areas were used. Seven classes were used where possible. Because the number of class choices available was much less than that for the Division IV students, more than one class per subject area frequently entered the calculation.) The ABE students were asked to indicate the number

of years since they had last enrolled in school. Fifty-six students responded with a mean of 14.4 and a standard deviation of 7.87. The scores ranged from 1 to 32. Sixty-two students had been employed an average of 7.37 years with a standard deviation of 5.56. The scores ranged from 0 to 26.

Table 5
Grades in Which ABE Students Were Last Enrolled Before Entering ABE Program

Last Grade	Frequency	Percent
7	2	3.0
8	10	14.9
9	10	14.9
10	20	29.9
11	12	17.9
12	1	1.5
No response	12	17.9

Apart from the Consumer Mathematics course, Geo-Trigonometry appeared to be the least popular Mathematics class followed by General Mathematics and by Computer Science (Table 6). Less than one quarter of the ABE students took General Mathematics. Just under one third of the ABE students took only one Algebra class while over one third took two Algebra classes.

Table 6
Number of ABE Students and the Number of Math Classes Completed

No. of	Algebra		Geo-Trig		Compsc		Genmath		Consmath	
classes	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
0	19	28.4	54	80.6	49	73.1	52	77.6	63	98.0
1	21	31.3	13	19.4	6	9.0	14	20.9	4	6.0
2	27	40.3	0	00.0	12	17.9	1	1.5	0	00.0

ABE students enrolled least frequently in Chemistry and Physics (just over three quarters of the students did not enroll in any Chemistry or Physics classes) and most frequently in Biology (Table 7). Just under one third of the ABE students completed one course in Biology and just over one third completed two courses in Biology.

Table 7
Number of ABE Students and the Number of Science Classes Completed

No.of classes	Biology Freq	Biology Perc	Chemistry Freq	Chemistry Perc	Physics Freq	Physics Perc
0	21	31.3	51	76.1	51	76.1
1	21	31.3	7	10.4	6	9.0
2	25	37.3	9	13.4	10	14.9

Fourteen (20.9%) of the ABE students indicated plans of going on to university, 41 (61.2%) planned to attend a technical school or college, 7 (10.4%) planned to further their education, and 4 (6.0%) planned to gain permanent or better employment. One student did not respond.

GED Students

The average age of the GED students was 32.5 years with a standard deviation of 8.39. The scores ranged from 18 to 58. The grade in which the majority of the GED students enrolled last was Grade 10 (Table 8). None of the students had enrolled in Grade 12. The GED students' average score on the five GED subtests was 58.6 with a standard deviation of 5.72. The scores ranged from 47 to 70. (The GED standard for Grade 12 standing requires scores of no less than 45 in each of the subtests.)

Table 8
Grades in Which GED Students Were Last Enrolled Before Entering GED Program

Last Grade	Frequency	Percent
8	3	4.3
9	9	13.0
10	36	52.2
11	21	30.4

The GED students had been removed an average of 16.2 years from their last public schooling. The standard deviation was 8.36; the scores ranged from 2 to 40. The average number of years of employment for the GED students was 12.3 years with a standard deviation of 6.92. The scores ranged from 0 to 26 with three students giving no response.

Eight (11.6%) of the GED students indicated plans of attending university, 13 (18.8%) planned to attend a technical school or college, 16 (23.2%) planned to further their education, 24 students (34.7%) planned to gain permanent or better employment, 1 indicated participation in the study for personal enjoyment, and 7 did not respond.

Measures of Reliability and Homogeneity of Variance

Before the groups are compared on the GAB and ATFR test results, measures of data reliability and homogeneity of variance will be presented.

Reliability Measures

Cronbach Alpha coefficients were calculated for each of the three program groups using the four 8-minute subtest scores in the GAB test and using the eight subtest scores in the ATFR test (Table 9). The Chronbach Alpha coefficients were very similar for all of the three program groups. The Cronbach Alphas were somewhat lower for the GAB subtests than was indicated using the split-half reliability coefficient (Schubert, 1986). The average of the Cronbach Alpha measures for the ATFR fell just within the range of earlier measures calculated. Cronbach Alphas calculated on the total data would be more reliable and perhaps higher in value.

Table 9
Cronbach Alpha Reliabilities Using the Subtest Scores of the Three Program Groups

Program	N	GAB	ATFR
Div IV	134	0.675	0.559
ABE	67	0.676	0.650
GED	69	0.656	0.591

Tests of Homogeneity of Variance

The variances of the groups in each of the three programs were compared for homogeneity using the Hartley test for the average program scores and the GAB and ATFR total scores (Table 10). The entry in "Number of Subjects" column is always the highest number of students in a group represented in that program. For example, in the Division IV student data, the class enrollments in the regions were — 23, 19, 46, 26, and 22. The highest number of students in a given region was 46. However, the average number of students per region was 27.2. For five variances and for 30 subjects F(crit) = 2.78, suggesting homogeneity of variance for the GAB test also.

Table 10
Tests of Homogeneity of Variance Using the Hartley Test

Prog	Test	Num of Sub[a]	Num of Var[b]	Low Var	High Var	F(crit) (0.95)	F
Div IV	Av	46	5	6.97	10.32	2.41	2.18
	GAB	46	5	7.48	11.97	2.41	2.56
	ATFR	46	5	3.91	5.32	2.41	1.85
ABE	Av	37	4	8.04	10.38	2.48	1.66
	GAB	37	4	9.26	14.38	2.48	2.40
	ATFR	37	4	3.16	5.27	2.48	2.79
GED	Av	27	3	5.57	6.34	2.68	1.30
	GAB	27	3	11.10	13.24	2.68	1.42
	ATFR	27	3	4.51	4.68	2.68	1.08

[a]Maximum number of subjects per region
[b]Only those variances included where n is greater than three

Similarly, for the ATFR test results of the ABE student group, the class enrollments were — 5, 37, 14, 3, and 8. The average number of students per region was 16. It should be mentioned that because the tables for testing homogeneity of variance (Winer, 1971, p. 875) have entries for more than five subjects only (i.e., four degrees of freedom), the number of variances was defined by the number of regions that had more than four students in the sample. Therefore, for four variances and for 20 subjects (above the average of 16), F(crit) = 3.29, again suggesting homogeneity of variance. (It should also be noted that the Hartley test for the homogeneity of variance is regarded as robust and that any small deviations from homogeneity should not appreciably affect the analysis results.) From the above it can therefore be concluded that the regional groups of each of the programs can be regarded as from the same population as their other regional counterparts, and therefore the scores can be lumped together for analysis.

The Hartley test for homogeneity of variance was further applied to the GAB and ATFR total scores of the three program groups. For three variances and n = 69, F (crit) = 1.69. The F values for the test scores of the GAB (variances ranged from 117.29 to 152.28) and the ATFR (variances ranged from 16.89 to 24.90) were 1.30 and 1.47 respectively. One could conclude, therefore, that the three program

student groups were drawn from the same population and that further analysis was warranted.

Comparison of Program Groups

Before the means of the three student groups are compared, a few observations about the minimum scores of the three groups on both the GAB (total) and the ATFR will be presented. While the minimum score of the Division IV total student group and the GED student group on the GAB was 37, the minimum score of the ABE student group was 32. On the ATFR both the Division IV total student group and the GED students scored a minimum of 11, while the ABE students scored a minimum of 6. All of the GED students scored within the range of the Division IV student group on both the GAB and ATFR tests. However, a total of 54 ABE students (80.6%) scored within the range of the Division IV student group on both the GAB and ATFR test.

The program groups will now be compared on the GAB (both the 8-minute subtests and the total test scores) and the ATFR total test scores using the *t* test. (The alpha-level of significance chosen for this study is .05.) Only the randomly selected Division IV student scores will be used in this analysis. The first *t* score and probability columns in Table 11 compare the two highest means; the second *t* score and probability columns compare the two lowest mean scores.

For all test score comparisons, including GAB subtest scores and total scores and ATFR total scores (Table 11), except Word Meaning (in which case the GED students scored significantly higher than did the Division IV students), the Division IV and GED students' scores were statistically equivalent. The ABE students scored significantly lower than the highest scoring group in all tests except in Word Meaning, in which case they scored second to the GED students. They also scored significantly lower than the Division IV students on Verbal Analogies and significantly lower than the Division IV and GED students on Arithmetic Problems, Logical Answers and the ATFR. The ABE students' scores were not significantly different than those of the GED students on the Verbal Analogies test, neither were they significantly different than those of the Division IV students on the total GAB scores.

Table 11
Comparison of Division IV, ABE, and GED Student Scores

Test	DivIV (46)	GED (69)	ABE (67)[c]	t[a]	Prob[a]	t[b]	Prob[b]
Word	23.83	26.09	24.40	1.62	0.108	0.52	0.604
Mean	4.98[d]	5.84	6.29				
Verb	20.35	18.72	17.18	1.74	0.085	1.76	0.081
Anal	4.65	5.08	5.18				
Arith	9.11	9.62	8.19	1.33	0.186	2.21	0.029
Prob	2.19	1.92	2.14				
Log	5.52	5.51	4.61	0.04	0.970	2.56	0.012
Answers	1.89	2.08	2.01				
GAB	58.80	59.94	54.39	0.53	0.597	1.96	0.052
(Total)	10.83	11.56	12.34				
ATFR	20.54	19.78	16.13	0.92	0.362	4.47	0.000
(Total)	4.11	4.53	4.99				

[a]Comparison of two highest means
[b]Comparison of two lowest means
[c]Number of students in group
[d]Standard Deviation

Correlation of Relevant Scores

The correlation of relevant scores in each of the program groups will now be given. This information should help to identify predictors of performance on the GAB and ATFR. Then, using the Division IV data, regression models may be established to predict success at the university level.

Division IV Students (Total Sample)

We are not so much interested in the comparison between the program groups as in the relationship between the dependent variables and the independent variables of a given program group. Therefore the total sample was used. The independent variables that related positively to both the GAB, as well as the ATFR, are the Average score in the high school program completed, and the number of courses taken in each of the subjects — Geo-Trigonometry, Geometry, Computer Science, and Physics (Table 12). The number of courses taken in Calculus correlated only marginally with the GAB score. The males appeared to score statistically higher than the females in the ATFR; also, the number of courses taken in Algebra and Chemistry related positively to the ATFR scores. The number of courses taken in Biology related negatively to the ATFR scores.

Table 12
Correlation Coefficients Between Dependent Variables and Selected Independent Variables for Division IV Students

	Gender[a]	Average	Algebra	Geo-Trig	Geometry
GAB	-.134	.512	.114	.237	.343
	.061[b]	.000	.094	.003	.000
ATFR	-.299	.416	.183	.277	.305
	.000	.000	.017	.001	.000

n = 134
[a]For Gender, male = 1, female = 2
[b]Probability

Table 12 (Cont'd)
Correlation Coefficients Between Dependent Variables and Selected Independent Variables for Division IV Students

	Calculus	Compsc	Biology	Chemistry	Physics
GAB	.139	.180	-.115	.117	.318
	.055	.019	.094	.089	.000
ATFR	.015	.195	-.226	.153	.364
	.433	.012	.004	.039	.000

ABE Students

The independent variables that correlated positively with both the GAB and the ATFR were the Average ABE program scores, and the number of courses taken in Geo-Trigonometry and Physics (Table 13). The number of courses taken in Algebra correlated positively with the ATFR and marginally positive with the GAB. Both dependent variables correlated negatively with the number of Biology courses taken. Gender, Age, and number of years since last enrolled in school correlated negatively with the ATFR test scores. The number of courses completed in Computer Science correlated negatively with the total GAB score; the number of courses taken in Chemistry correlated marginally negatively with the GAB test score.

Table 13
Correlation Coefficients Between Dependent Variables and Selected Independent Variables for ABE Students

	Gender[a]	Age	Average	GradYr	Algebra
GAB	-.177	.022	.421	.088	.195
	.076[b]	.431	.000	.259	.057
ATFR	-.268	-.348	.489	-.393	.360
	.014	.002	.000	.001	.001

n = 67
[a]For Gender, male = 1, female = 2
[b]Probability

Table 13 (Cont'd)
Correlation Coefficients Between Dependent Variables and Selected Independent Variables for ABE Students

	Geo-Trig	Compsc	Biology	Chemistry	Physics
GAB	.330	-.217	-.274	-.199	.308
	.003	.039	.011	.053	.006
ATFR	.399	.046.	-.345	.122	.504
	.000	.355	.002	.163	.000

GED Students

It is apparent that the Average scores achieved in the GED correlated positively with both the GAB and ATFR scores (Table 14). Gender correlated positively with the GAB, suggesting higher scores for females than for males. The number of years employed correlated negatively with the GAB and grade level enrolled in last, before embarking on the GED test program, correlated marginally with the GAB score.

Table 14
Correlation Coefficients Between Dependent Variables and Selected Independent Variables for GED Students

	Gender[a]	Grade	Average	Empl Yr
GAB	.275	.199	.742	-.299
	.011[b]	.050	.000	.007
ATFR	-.147	.084	.664	-.060
	.113	.245	.000	.316

n = 69
[a]For Gender, male = 1, female = 2
[b]Probability

Multiple Linear Regression Analysis

In this section an attempt is made to identify appropriate predictive models of students' performance on the GAB and ATFR tests given known independent variables. Regression models may help to predict the degree of success students may have in going on to university. The correlational analyses in the previous section will serve to identify appropriate independent variables. Separate models will be identified for each of the two tests and for each of the program groups.

Division IV Students

Before the multiple linear regression analysis is undertaken, the characteristics of the GAB and ATFR scores of the Division IV students (who are eligible to enter the Faculty of Arts program at the University of Regina) will be presented. The mean scores of the Division IV students (Table 15) eligible to enter the Faculty of Arts program at the University of Regina were consistently higher than those of the random Division IV student group for all GAB (total and subtest) and ATFR scores. The minimum scores were equivalent for the GAB (subtest and total) scores. However, the minimum ATFR score of the random group was 12. When establishing predictive models for each of the ABE and GED student groups, the Division IV minimum standards shall be applied. Because the minimum scores on the GAB and the ATFR of the Division IV university-eligible group are identical to those of the total Division IV student sample, predictive standards using the regression analysis apply equally to the university-eligible students and to the students with Grade 12 (Division IV) standing.

Table 15

Means, Standard Deviations, and Minimum Scores of GAB (Total and Subtest) and ATFR of Division IV Students Eligible for Entry to the Faculty of Arts Program at the University of Regina

	Word Mean	Verb Anal	Arith Prob	Log Answ	GAB (Tot)	ATFR
Mean	25.36	21.67	9.86	6.37	63.26	21.82
SD	4.85	4.85	1.82	1.90	10.29	4.33
Min	12.00	7.00	3.00	1.00	37.00	11.00

The purpose of carrying out the regression analysis for the Division IV student group is to provide a comparison of the significant predictor set with those of the ABE and GED students and this may serve to provide a prediction model for some future time. (Currently eligibility to enter university is determined by credits and average scores obtained in the Division IV program.)

The number of courses taken in each of Algebra, Geo-Trigonometry, Geometry, and Computer Science tended to correlate positively (significantly in all cases except for Algebra with the GAB score) with both the GAB and ATFR scores. The number of courses taken in Calculus correlated marginally only with the GAB score. These variables became part of the independent variable set. Similarly, because the number of courses taken in Physics and Chemistry correlated positively (significantly in all cases except marginally for Chemistry with the GAB score) with both criterion measures, and because the number of courses taken in Biology correlated negatively (significantly with the ATFR score) with both the GAB and ATFR, these variables also became part of the independent variable set. With the GAB scores as the dependent variable and Gender, Average, and the set of Mathematics and Science variables indicated above as the independent predictor variable set, a stepwise regression analysis yielded the results presented in Table 16.

Table 16
Stepwise Multiple Regression Analysis of the Independent Variables on the Dependent Variable GAB for the Division IV Students

Step	Variable	R^2	Df	B	F	Prob
1	Average	.261	(1,132)	.578	46.533	.0000
2	Geometry	.341	(2,131)	10.532	33.878	.0000
3	Gender	.384	(3,130)	-4.425	26.974	.0000
	Constant = 22.326			Standard Error = 8.418		

The entries in the regression analysis tables (excluding the B - weights) present the parameters of the regression model when the variable indicated is added to the regression model of the previous step. The B - weights apply only to the full model. The Average score, the number of courses taken in Geometry and Gender

(in that order) contributed significantly to the variance of the dependent variable, GAB. These variables explained 38.4% of the variance (R^2) of the GAB test scores.

The stepwise multiple regression of the predictor variable set on the ATFR (Table 17) indicated that the Average, Gender, the number of courses taken in Geometry, Calculus, and Physics (in that order) significantly contributed to the variance of the dependent variable, ATFR. These variables explained 42.1% of the variance of the ATFR test scores.

Table 17
Stepwise Multiple Regression Analysis of the Independent Variables on the Dependent Variable ATFR for the Division IV Students

Step	Variable	R^2	Df	B	F	Prob
1	Average	.171	(1,132)	.219	27.253	.0000
2	Gender	.292	(2,131)	-2.940	27.018	.0000
3	Geometry	.367	(3,130)	3.220	25.078	.0000
4	Calculus	.393	(4,129)	-2.214	20.906	.0000
5	Physics	.421	(5,128)	1.125	18.604	.0000
	Constant = 7.133		Standard Error = 3.412			

It may be desirable to use the regression results to predict eligiblity for entrance to university programs. When the minimum conditions of the Division IV students (eligible to enter the Faculty of Arts at the University of Regina) as given in Table 15 were applied, 125 of the 134 Division IV students scored within the range of the university eligibles. In order to exceed the standard error in the cases of both tests, the minimum Division IV score in the GAB should be 46 (sixth percentile for college students [Schubert, 1986]) and for that of the ATFR, 15. Given these constraints (and using the regression model as a criterion), 112 of the 134 Division IV students (83.6%) scored within the range of the university eligibles.

ABE Students

The stepwise regression of the variable set (including the Average score, Gender, and the frequency of enrollment in the Mathematics and Science courses, as suggested by the correlation coefficients presented in Table 13) on the GAB total score (Table 18) indicated that the Average score and the frequency of enrollment

in Geo-Trigonometry, Computer Science, Chemistry, and Biology (in that order) were the variables that contributed significantly to the variance of the dependent variable, GAB. These variables explained 36.2% of the variance of the GAB test scores.

Table 18
Stepwise Multiple Regression Analysis of the Independent Variables on the Dependent Variable GAB for the ABE Students

Step	Variable	R^2	Df	B	F	Prob
1	Average	.177	(1,65)	.432	14.019	.0004
2	Geo-trig	.237	(2,64)	7.694	9.948	.0002
3	CompSc	.309	(3,63)	-4.962	9.390	.0000
4	Chemistry	.362	(4,62)	-3.767	8.812	.0000
5	Biology	.405	(5,61)	-3.530	8.318	.0000
	Constant = 28.056		Standard Error = 9.895			

The stepwise regression of the independent variable set (including Gender, Age, Average score, years since last in school, and frequency of enrollment in Mathematics and Science courses) on the ATFR score (Table 19) indicated that the variables that contributed significantly to the variance of the dependent variable, ATFR, were the frequency with which students enrolled in Physics and the Average score (in that order). The variables explained 49.8% of the variance of the ATFR test scores.

Table 19
Stepwise Multiple Regression Analysis of the Independent Variables on the Dependent Variable ATFR for the ABE Students

Step	Variable	R^2	Df	B	F	Prob
1	Physics	.254	(1,65)	2.748	22.160	.0000
2	Average	.394	(2,64)	.195	20.770	.0000
	Constant = .498		Standard Error = 3.947			

When the minimum conditions of the Division IV students (eligible to enter the Faculty of Arts at the University of Regina) as given in Table 15 were applied, 53 of the 67 ABE students scored within the range of the university eligibles. However, in order to exceed the standard error in the cases of both tests, the minimum ABE score in the GAB should be 47 (seventh percentile for college students [Schubert, 1986]) and for that of the ATFR, 15. Given these constraints, 32 of the 67 ABE students (47.8%) scored within the range of the university eligibles.

GED Students

The stepwise regression of the predictor variable set (including Average of GED scores, Gender, Grade, and Empl Yr [number of years employed] as suggested in Table 14) on the GAB scores (Table 20) indicated that only the Average and Gender contributed significantly to the variance of the dependent variable, GAB. These variables explained 61.5% of the variance of the GAB test scores.

Table 20
Stepwise Multiple Regression Analysis of the Independent Variables on the Dependent Variable GAB for the GED Students

Step	Variable	R^2	Df	B	F	Prob
1	Average	.578	(1,64)	1.504	87.737	.0004
2	Gender	.615	(2,63)	4.537	50.369	.0000
	Constant = -35.331			Standard Error = 7.423		

The stepwise regression of the variable set (defined above) on the ATFR score (Table 21) indicated that again the variables Average and Gender contributed significantly to the variance of the dependent variable, ATFR. These variables explained 51.7% of the variance of the ATFR test scores.

Table 21
Stepwise Multiple Regression Analysis of the Independent Variables on the Dependent Variable ATFR for the GED Students

Step	Variable	R^2	Df	B	F	Prob
1	Average	.477	(1,64)	.557	58.406	.0000
2	Gender	.517	(2,63)	-1.802	33.716	.0000
	Constant = -10.380			Standard Error = 3.184		

When the minimum conditions of the Division IV students (eligible to enter the Faculty of Arts at the University of Regina) as given in Table 15 were applied, 68 of the 69 GED students scored within the range of the university eligibles. However, in order to exceed the standard error in the cases of both tests, the minimum GED score in the GAB should be 45 (sixth percentile for college students [Schubert, 1986]) and for that of the ATFR, 15. Given these constraints, 58 of the 69 GED students (84.1%) scored within the range of the university eligibles.

Profiles of University Eligibles

The profiles of the three student program groups who met the entrance requirements (using the Division IV Average grades and the multiple linear regression results as appropriate criteria) of the Faculty of Arts, University of Regina, will now be presented.

Division IV Students

The number of university eligibles was 125 out of a total of 134 (applying the Faculty of Arts, University of Regina standards) and using the multiple regression model the predicted number of university eligibles was 112 students (83.6%). Sixty-three of these students were males, 49 were females.

The high school Average mark of the Division IV students was 81.3% with a standard deviation of 7.45 and a range of 66 to 97. A higher majority than that of the random Division IV student group (82.6%) took two Algebra classes (Table 22); all but two students took at least one Algebra class. Geo-Trigonometry was, again, a much more popular class than was Geometry. Just over one third of this student group took Calculus and just under one half of the students took a Computer Science course beyond the Grade 10 level. Enrollment in Algebra, Geo-Trigonometry, and Calculus were higher than were those of the Division IV student groups (both random and total).

Table 22
Number of Division IV University-Eligible Students and the Number of Math Classes Completed

No. of	Algebra		Geo-Trig		Geom		Calc		Compsc	
classes	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
0	2	1.8	13	11.6	99	88.4	72	64.3	63	56.3
1	9	8.0	39	34.8	13	11.6	40	35.7	29	25.9
2	101	90.2	60	53.6	0	00.0	0	00.0	20	17.9

Both Chemistry and Physics classes were more popular than Biology. About three quarters of the students enrolled in two Chemistry classes (this was higher than the number of enrollees of both the random and total groups) and about three quarters of the students enrolled in two Physics classes (this was higher than the number of enrollees in the total group and somewhat lower than the

number of enrollees in the random group). Just under two thirds of the students (less than those students in both the random and total samples) enrolled in two Biology classes (Table 23).

Table 23
Number of Division IV University-Eligible Students and the Number of Science Classes Completed

No.of classes	Biology Freq	Biology Perc	Chemistry Freq	Chemistry Perc	Physics Freq	Physics Perc
0	23	20.5	10	8.9	10	8.9
1	17	15.2	16	14.3	19	17.0
2	72	64.3	86	76.8	83	74.1

Of the 112 Division IV students, 89 (79.5%) indicated plans of continuing on to university, 13 (11.6%) were planning to receive training in some college or technical school, 5 (4.5%) indicated interest in further education, 3 (2.7%) were considering either permanent or better employment, the remaining 2 did not respond. The proportion of students interested in university was somewhat higher than it was for those of the random and total Division IV groups.

ABE Students

Of the 32 ABE students eligible to enter the University of Regina, 11 were males and 21 were females. In this sample there were about twice as many females as males compared with about four times as many females as males in the total sample.

The average age of the ABE students was 29.09 years with a standard deviation of 5.54. The scores ranged from 20 to 42. The Average score obtained in the ABE program was 79.22% with a standard deviation of 9.28. The scores ranged from 57 to 94. The students had been removed an average of 12.81 years from their public schooling. The standard deviation was 5.99. The scores ranged from 2 to 29. The average number of years employed was 7.52 with a standard deviation of 4.47. The scores ranged from 1 to 17.

The ABE university-eligible students tended to be younger, scored considerably higher in the ABE program, were removed from school a fewer number of years,

and were employed more years than were the students of the total ABE student sample.

A comparison between the entries in Table 24 and those in Tables 6 and 7 indicated that the university-eligible ABE students tended to enroll more frequently in Algebra, Geo-Trigonometry, and Physics classes, and less frequently in Biology classes, than did the students of the total ABE sample.

Table 24
Number of University-Eligible ABE Students and the Number of Classes Completed

No.of classes	Algebra		Geo-Trig		Biology		Physics	
	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
0	5	15.6	21	65.6	13	40.6	19	59.4
1	9	28.1	11	34.4	12	37.5	05	15.6
2	18	56.3	00	00.0	07	21.9	08	25.0

GED Students

Of the 58 GED students eligible to enter the University of Regina, 31 were males and 27 were females. The gender ratio for this group was very similar to that of the total GED sample. The average age of the GED university-eligible students was 31.91 years with a standard deviation of 7.92. The scores ranged from 18 to 52. The GED students' average score on the five GED subtests was 59.84 with a standard deviation of 5.13. The scores ranged from 50 to 70. The GED university-eligible students had been removed an average of 15.57 years from their last public schooling. The standard deviation was 8.00; the scores ranged from 2 to 37. The average number of years of employment for the university-eligible GED students was 11.89 with a standard deviation of 6.75. The scores ranged from 1 to 25 with three students giving no response.

The university-eligible GED students were slightly younger, scored higher on the GED tests, were fewer years removed from school, and worked fewer years than did the students of the total GED student sample.

DISCUSSION AND CONCLUSIONS

The Gender groups were quite equally matched for both the Division IV (including the random sample) and the GED student samples. The ABE student sample was predominantly female.

The average age of the GED students was about two years greater than that of the ABE students; and the spread of the ages of the GED students was also greater. A higher percentage of the GED students last enrolled in Grades 11 and 12 than did those of the ABE students. The GED students registered about five more years of employment than did the ABE students; the spread was greater for the GED students than it was for the ABE students. A much higher percentage of Division IV students than of ABE students had plans of going on to university and a higher percentage of ABE students had plans of going on to university or of attending a technical school, than had GED students.

There was a higher percentage of ABE students that did not enroll in Algebra, Geo-Trigonometry, or Computer Science than there was of the Division IV (random sample) students. The same is true of the three Sciences. Enrollment in multiple Science classes was much greater for the Division IV students than it was for the ABE students. The reason for this is that the students in the ABE program are required to take one Mathematics and one Science class in Grade 11 and one Mathematics class or one Science class in Grade 12.

The GED students scored significantly higher than did the Division IV students in Word Meaning. Perhaps this can be partially understood in the light of the previous study of the Division IV and ABE curricula and GED tests (Toews, 1988). The GED tests were found to have a stronger skill emphasis than both the Division IV and ABE curricula in Communications (Writing Skills); in Literature, however, the Division IV curriculum emphasized skill more strongly than did the GED test. Furthermore, the GED Communications (Writing Skills) test emphasized higher cognitive skills more frequently than did both the Division IV and ABE curricula. Although the comparison of the Division IV and ABE Communications curricula indicated that the Division IV curriculum exhibited a broader scope, greater skill emphasis and higher skill emphasis than did the ABE curriculum, the mean scores of the ABE and Division IV students did not differ significantly in Word Meaning.

The Division IV Communications curriculum was broader in scope than was that of the ABE curriculum. Perhaps this, together with the Division IV and ABE Communications curricula comparison (above paragraph), helps clarify why the

ABE students scored significantly lower than did the Division IV students in Verbal Analogies.

The Division IV students scored significantly higher than did the ABE students in both the Arithmetic Problems and Logical Answers subtests. The previous study (Toews, 1988) indicated that although the Division IV and ABE Mathematics curricula exhibited an equal emphasis of higher cognitive skills, the Division IV Mathematics curricula presented a broader scope and emphasized skills more strongly than did the ABE Mathematics curricula. A much higher percentage of the Division IV students were enrolled in Geo-Trigonometry (which requires logical reasoning in establishing mathematical proofs) than there were of the ABE students.

The GED students scored significantly higher than did the ABE students in both Arithmetic Problems and Logical Answers. Although the GED Mathematics test exhibited less scope than did the ABE Mathematics curricula, it emphasized skill and higher cognitive skills more strongly than did the ABE Mathematics curricula.

Although the GED students scored significantly higher than did the ABE students on the GAB (total) test, the middle scoring group (Division IV) scored statistically equivalent to both the GED and the ABE student groups. The previous study (Toews, 1988) indicated that the GED test items generally had a stronger skill emphasis and higher skill emphasis than did the evaluation criteria of both the Division IV and ABE curricula.

The Division IV and the GED students obtained statistically equivalent scores on the ATFR, but both student groups scored significantly higher than did the ABE student group. Logical reasoning as measured by the ATFR is thought to grow and mature over extended periods of time of exposure to relatively rich, cognitively challenging experiences. Perhaps the majority of the ABE students lacked such experiences. It is also possible that the ABE students are generally less academically inclined than are the Division IV and GED students since about 150% as many GED students had enrolled beyond Grade 10 as had of the ABE students.

The Average scores in each of the three programs contributed significantly to an explanation of the variances of both the GAB and ATFR test scores. This is to be expected as the Average scores express the academic achievement which manifests verbal and quantitative abilities as well as the ability to deal formally with new information.

Furthermore, knowledge of Gender for both the Division IV and GED students, helped to explain the variance of both the GAB and ATFR test scores. The Division IV male students tended to score higher than the female students in both the GAB and ATFR tests. This may reflect comparative gender performance in the nonrandomly selected groups of students taking subjects such as Algebra 30 (average to above average) and Geo-Trigonometry 30 (above average). However, in the case of the GED students, the male students tended to score higher than the female students only in the ATFR test; in the GAB the female students tended to score higher than the male students.

Enrollment in Geometry (in the case of the Division IV students) and Geo-Trigonometry (in the case of the ABE students) contributed significantly, in each program group, to the variance of the GAB total scores. Of the 134 Division IV students, only 13 (9.7%) students enrolled in one Geometry course, whereas 46 (34.3%) enrolled in one Geo-Trigonometry course and 66 (49.3%) enrolled in two Geo-Trigonometry courses. Thirteen (19.4%) of the ABE students enrolled in one Geometry course. The two subtests, Word Meaning and Verbal Analogies, are to relate positively to college grades in Mathematics (Schubert, 1986).

High ABE enrollment in Computer Science, Biology, and Chemistry predicted lower GAB total scores. This, however, was not the case with the Division IV students. It was found in the earlier study (Toews, 1988) that the Science Division IV curricula emphasize skill and higher cognitive skills more strongly than do the ABE curricula. The predictive strength and the direction of that prediction, of ABE enrollment, may also reflect what particular cognitive demands are placed on the ABE students. The students may find it necessary to memorize a large portion of the materials and thus minimize dependency on Word Meaning, Verbal Analogies, and providing Logical Answers.

The Average scores of the students in both of the Division IV and ABE programs also contributed significantly to the variance of the ATFR total scores. The Average score, the composite of performance in Grades 11 and 12 English, Mathematics courses, and the Science courses (among others), should reflect students' ability to reason logically. For the Division IV students, enrollment in Geometry helped predict performance on the ATFR; and for both the Division IV and ABE students, enrollment in Physics helped predict performance on the ATFR. The geometric proofs (in the Division IV program) and problem solving in Physics (in both programs) may require more logical reasoning than do the other Mathematics and Science subjects.

It is apparent from the regression analysis that a larger number of Division IV and GED students (83.6% and 84.1% respectively) fell within the scores of university eligibility, using both the GAB and ATFR tests as criteria, than of ABE

students (47.8%). Again, it was observed that a larger percentage of GED students than ABE students had received schooling beyond the Grade 10 level. It appears that the ABE students are generally less able to deal with the quantitative and verbal skills demanded by the GAB and the formal reasoning tasks required by the ATFR.

SUMMARY

1. A greater percentage of GED students than of the ABE students had enrolled in school beyond the Grade 10 level.

2. The average age of the GED students was about two years greater than that of the ABE students, and they indicated that they had been employed about five years longer than had the ABE students.

3. A much higher percentage of the Division IV students than of the ABE students had plans of going on to university, and a higher percentage of the ABE students than of the GED students had plans of going on to university.

4. Enrollment in multiple Mathematics and Science classes was much greater for the Division IV students than it was for the ABE students.

5. The minimum GAB and ATFR scores of both the Division IV and GED students were equivalent. These were higher than those of the ABE students. When considering the GAB and ATFR scores as criteria of acceptable performance for Grade 12 standing, at least 80.6% of the ABE students performed at the Grade 12 (Division IV) level.

6. The GED students scored significantly higher than did the Division IV students in Word Meaning. The Word Meaning scores of the ABE students did not differ significantly from those of both the Division IV and GED students.

7. For all GAB subtest score comparisons (except for Word Meaning) the Division IV and GED students' scores were statistically equivalent.

8. The ABE students scored significantly lower than did the Division IV students on Verbal Analogies and significantly lower than both the Division IV and GED students on both Arithmetic Problems and Logical Answers.

9. The Verbal Analogies test scores of both the ABE and GED students were statistically equivalent.

10. The relatively high performance of the GED students on the GAB test may reflect the skill emphasis and higher skill emphasis observed in the GED test items.

11. The GED students scored significantly higher than did the ABE students on the GAB (total) test. The Division IV students (the middle scoring group) scored statistically equivalent to both the GED and ABE student groups.

12. The mean scores of the Division IV and GED student groups on the ATFR were statistically equivalent. The ABE students scored significantly lower than did both the Division IV and GED student groups.

13. The Average high school score, frequency of enrollment in Geometry, and Gender were significant predictors of the Division IV (total sample) GAB scores. Gender favored the males. The variance of the GAB scores explained by these predictors was 38.4%.

14. The Average high school score, Gender, and frequency of enrollment in Geometry, Calculus, and Physics were significant predictors of the Division IV (total sample) ATFR total scores. Gender favored the males and enrollment in Calculus was a negative predictor when taken together with the other variables. The variance of the ATFR scores explained by these predictors was 42.1%.

15. The Average ABE program scores and frequency of enrollment in Geo-Trigonometry, Computer Science, Chemistry, and Biology were significant predictors of the ABE GAB scores. Enrollment in Computer Science, Chemistry, and Biology were negative predictors. The variance of the GAB scores explained by the total predictor set was 40.5%.

16. Frequency of enrollment in Physics and the Average ABE program scores were significant predictors of the ABE ATFR scores. The variance of the ATFR scores explained by these predictors was 39.4%.

17. The Average GED test scores and Gender were significant predictors of both the GED GAB and ATFR scores. For the GAB, Gender favored the female students, for the ATFR, Gender favored the male students. The variance of the GAB scores explained by these variables was 61.5%, and for the ATFR, 51.7%.

18. Given the university entrance criteria (for the Faculty of Arts, University of Regina) of the Division IV students, and the multiple linear regression predictive models for the respective groups, the percentages of university eligible students was 83.6% for the Division IV students, 47.8% for the ABE students, and 84.1% for the GED students.

RECOMMENDATIONS

Several problems warrant further exploration:

1. What is the comparative effectiveness of the prediction of success at the university of each of the multiple linear regression models, based on performance on the GAB and ATFR test instruments?

2. How do the performances (at the university) of students from the three programs, having similar GAB and ATFR scores, compare?

3. What do the teaching strategies used in teaching classes, whose frequency of enrollment correlate negatively with either or both of the GAB and ATFR tests, have in common?

4. What do the teaching strategies used in teaching classes, whose frequency of enrollment correlate positively with either or both of the GAB and ATFR tests, have in common?

REFERENCES

Arlin, P.K. (1984). *Arlin test of formal reasoning*. East Aurora, NY: Slosson Educational Publications.

Santmire, T.E. (1985). Review of Arlin test of formal reasoning. In J.V., Jr., Mitchell (Ed.), *Ninth mental measurements yearbook* (Vol. 1, pp. 81-83). Lincoln: University of Nebraska Press.

Schubert, H.J.P. (1986). *Schubert general ability manual*. East Aurora, NY: Slosson Educational Publications.

Toews, W. (June, 1988). *A comparison of three K-12 exiting programs: ABE, Division IV and GED*. Regina, SK: University of Regina, Faculty of Education, SIDRU.

University of Regina. (1989-1990). University of Regina general calendar. Regina, SK: Author.

Winer, B.J. (1971). *Statistical principles in experimental design* (2nd ed.). Toronto, ON: McGraw-Hill Book.

APPENDIXES

APPENDIX 1

STUDENT FORMS

Section II: 2.

Dear

I am writing to ask you to participate in a research study carried out by the Saskatchewan Instructional Development and Research Unit (SIDRU) for the Department of Education. The purpose of the study is to arrive at a better understanding of the degree of equivalency between the high school Division IV, Adult Basic Education (ABE), and the General Educational Development (GED) programs. Your participation will involve writing two tests which should take no more than two hours to complete. Results of your performance in each of the tests as well as a summary of the study will be sent to you upon request.

I trust that you realize the value of this study both to yourself as well as to the Department of Education and will decide to cooperate in the research project.

If you are prepared to participate in this study please enter your name and address in the space below and return this letter in the self-addressed envelope at your earliest convenience.

Sincerely,

William Toews, Ph.D.
Principal Researcher

NAME: _____

ADDRESS: _____

_____

RELEASE FORM

I,.....(please print your name),

give the Saskatchewan Instructional Development & Research Unit (SIDRU) permission to use the data I have provided, for this research project. I understand that all personal data will remain anonymous and that the data will be archived.

Signed: .....

Address: .....

.....

RELEASE FORM A

I,.....(please print your name),

give the Saskatchewan Instructional Development & Research Unit (SIDRU) permission to use the personal data form, the Arlin Test of Formal Reasoning (ATFR) and the Schubert General Ability Battery (GAB) results and the official grade 11 and 12 final marks for this research project. I understand that all personal data will remain anonymous and that the data will be archived.

Signed: .....

Address: .....

.....

Section II: 4.

PERSONAL DATA PORM (Grade 12)

Please provide the following information by circling the appropriate response and answering in the blanks provided.

NAME: .....

HOME (City/Town):.....

SEX: M F AGE:.....

What do you plan to do after you graduate from high school?

.....

PERSONAL DATA FORM (ABE AND GED)*

Please provide the following information by circling the appropriate response and answering in the blanks provided.

NAME: .....

HOME (City/Town): .....

SEX M F AGE: .....

PROGRAM: ABE GED

Last grade completed: .....

Last school attended: .....

Average mark for last year completed: ..... (This mark is accurate to within ..... percentage points: 0, 5, 10, 15, 20.)

Years since last grade completed: .....

Number of years employed: .....

What do you plan to do after you have completed this program?

.....

.....

*"ABE" is the abbreviation for Adult Basic Education
"GED" is the abbreviation for General Educational Development

APPENDIX 2

SAMPLES OF COMMUNICATIONS

University of Regina

Saskatchewan Instructional Development and Research Unit

Faculty of Education

Regina, Saskatchewan
Canada S4S 0A2

(306) 585-4798 4309
Educ. 220.4

SIDRU

April 7, 1989

Dear

This letter is a follow-up to the conversation that I had with you yesterday. As I indicated to you, the school division director, , has given us permission to initiate contact with the schools concerning the project. I will clarify briefly the purpose of the project and suggest ways of selecting the students to be included in the study.

This is a research project under contract with the Saskatchewan Instructional Development & Research Unit (SIDRU) for Saskatchewan Education. The purpose is to analyze the relative performance of three groups of students exiting from three different K-12 programs - Division IV, Adult Basic Education (ABE) and the General Educational Development (GED) tests - on the Arlin Test of Formal Reasoning (ATFR) and the Schubert General Ability Battery (GAB). These results are to be further compared to their average grade in their previous programs - grade 12, ABE 12 and GED - and to other demographic variables including sex, age, rural/urban location, years of employment, last grade completed and years since last attending school. The results should help identify the degree of equivalency between the K-12 exiting students with respect to logical reasoning and acquired verbal and numerical skills; they should shed light on the curriculum study just completed - A Comparison of Three K-12 Exiting Programs: ABE, Division IV and GED; they should help in making decisions with respect to post-secondary entrance requirements; and they should provide information concerning potential K-12 exiting program revision.

The selection of participating schools is determined by the existence of Adult Basic Education programs in the area (i.e., in this case). As I indicated, I request permission to administer the two instruments to 60 grade 12 students. The student sample is restricted to those students who took at least one math class and one science class in grade 11 and who took at least one math class or one science class in grade 12. Student demographic data as

well as permission to use their grade 11 and 12 official final grades will also be elicited. The administration time of the instruments should be no more than two hours. (Copies of test instruments and data sheets are enclosed.)

I would like to list several possible selection procedures.

1. Select eligible students with computer, then randomly select 60 of these. Meet with students and obtain commitment.

2. Announce over the P.A. system the type of grade 12 students required. Ask these students to a meeting to clarify the study. Obtain commitment from students and then randomly select.

3. Announce the study in grade 12 classes. Randomly select students that qualify. Invite students to a meeting, obtain commitment, then randomly select.

4. Announce the study in grade 12 classes. Obtain commitment of those that qualify. Randomly select classes having at least, say 80% students that qualify. Obtain commitment of those that qualify.

5. Announce the study in grade 12 math or science classes. Obtain commitment of those that qualify. Randomly select science classes having at least 80% students that qualify. Perhaps the science classes would be restricted to chemistry and physics because of the math requirement.

The suggested procedures are listed in order of the more theoretically ideal to the less ideal. Perhaps we can use the procedure most ideal yet reasonably practical.

Should permission be given to collect the data indicated, we would hope to administer the instruments before the end of April, 1989. I look forward to hearing from you.

Sincerely,

W. Toews.

Dr. W. Toews
Researcher
Adult Basic Education Project - PH II
SIDRU
Telephone Number: 585-4621

WT/ji

Encls.

University of Regina

Saskatchewan Instructional Development and Research Unit

Faculty of Education | Regina, Saskatchewan Canada S4S 0A2 | (306) 585-4798 4309 Educ. 220.4

SIDRU

April 7, 1989

Dear

This letter is a follow-up to a telephone conversation that I had yesterday with , Principal of , concerning a research project that I am carrying out. I was advised to inform you of my request. The school division director, , has given us permission to initiate contact with the school concerning the project. I will clarify briefly the purpose of the project and then make my request.

This is a research project under contract with the Saskatchewan Instructional Development & Research Unit (SIDRU) for Saskatchewan Education. The purpose is to analyze the relative performance of three groups of students exiting from three different K-12 programs - Division IV, Adult Basic Education (ABE) and the General Educational Development (GED) tests - on the Arlin Test of Formal Reasoning (ATFR) and the Schubert General Ability Battery (GAB). These results are to be further compared to their average grade in their previous programs - grade 12, ABE 12 and GED - and to other demographic variables including sex, age, rural/urban location, years of employment, last grade completed and years since last attending school. The results should help identify the degree of equivalency between the K-12 exiting students with respect to logical reasoning and acquired verbal and numerical skills; they should shed light on the curriculum study just completed - A Comparison of Three K-12 Exiting Programs: ABE, Division IV and GED; they should help in making decisions with respect to post-secondary entrance requirements; and they should provide information concerning potential K-12 exiting program revision.

The selection of participating schools is determined by the existence of Adult Basic Education programs in the area. I request permission to administer the two instruments to 30 grade 12 students. The student sample is restricted to those students who took at least one math class and one science class in grade 11 and those who took at least one math class or science class in grade 12. Student demographic data as well as permission to use their grade 11 and 12 official final grades will also be elicited. The administration time of the instruments should be no more than two hours. (Copies of test instruments and data sheets are enclosed.)

Should permission be given to collect the data indicated, we would hope to administer the instruments before the end of April, 1989. I look forward to hearing from you.

Sincerely,

W. Toews.

Dr. W. Toews
Researcher
Adult Basic Education Project - PH II
SIDRU
Telephone Number: 585-4621

WT/ji

Encls.

University of Regina

Saskatchewan Instructional Development and Research Unit

Faculty of Education

Regina, Saskatchewan
Canada S4S 0A2

(306) 585-4798 4309
Educ. 220.4

SIDRU

June 27, 1989

Dear

I would first like to express my appreciation to you for cooperating with the research study that I am carrying out for Saskatchewan Education.

You may recall that the students involved signed a permission slip for the release of their official ABE Grade 11 and 12 marks. Would you please send us the official ABE marks of the students involved in the study? I have appended the names of the students.

Thank you.

Sincerely,

Dr. W. Toews
Researcher
Adult Basic Education Project - PH II
SIDRU

WT/ji

Atts.

July 19, 1989

Dear

You will recall your involvement in a research project carried out for Saskatchewan Education this spring. One of the forms that you completed was the Personal Data Form (ABE and GED). Several questions in that form were misunderstood to refer to the current ABE program rather than to schooling previous to enrolling in the ABE program.

I am enclosing a copy of this form and asking you to enter your name and to complete the questions identified by the asterisks as they relate to your schooling before you enrolled in the ABE program (ie. your last school in the public or separate school system). Please return the completed Personal Data Form (ABE and GED) in the self-addressed, stamped envelope at your earliest convenience. I apologize for this misunderstanding.

I very much appreciate your involvement and cooperation in this project.

Sincerely,

William Toews

WT/mb/11
Encl.